Optimizing Resource Use on Tenant-Operated Pork-Producing Farms

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INTRODUCTION

Ohio pork producers desire to achieve greater efficiency in their farm business. Competitive demands require operating farmers to make changes in the organization of the farm business, as well as to alter operational decisions.

The increased complexity of farming makes it necessary to consider many factors in allocating farm business resources. One dimension often overlooked is that the operating farmer does not need to own all of the resources required. It may be more profitable for farm operators to use certain non-equity resource control techniques. Some ways of obtaining control of resource use other than by ownership are: 1) borrowing capital, 2) cash and share-leasing arrangements, 3) hiring custom work, and 4) exchange of work and machinery with neighbors. By using one or more of these techniques, a farm operator can adjust his resource use business structure. The real estate lease contract is of special interest as a resource control technique.

The use of electronic computers makes it possible to consider many factors by using linear programming techniques in the organizational planning phases of management which cannot be accomplished with other techniques.

PURPOSE

The purpose of this study was to develop, study, and test alternative organizational plans for 16 tenant-operated pork-producing farm business firms. Combinations of resources and patterns of resource use which maximize returns to the tenant's labor, capital, and management are not always the same as those which maximize returns to the landlord's resource inputs. The results presented are limited to the effects of different rotation patterns and hog management systems.

METHOD OF STUDY

Sixteen tenant pork producers in eight southwestern Ohio counties were interviewed to obtain the data.

The farm operations were selected to meet the following qualifications:

1. Family-managed unit utilizing family and hired labor.
2. Pork receipts comprised 50 percent or more of the livestock receipts.

3. At least 250 head but less than 1,200 head of hogs were marketed during 1965.
4. The operator derived major income from and had his headquarters on rented land; however, other land could be owned.

Coefficients were developed for each farm based on information collected from the farm tenant operator and recent research studies. The advice of subject matter specialists was used when empirical data were not available. An effort was made to quantify management by developing coefficients for each farm based on the actual performance of the 1965 livestock and cropping program.

Thirty-five to 40 possible production activities or alternatives and 27 to 30 restrictions were considered in arriving at the optimum farm organization for each farm. Budgets were developed for each farm and for both the landlord and the tenant. Yields were based on 1965 farm performance unless the operator reported that 1965 was an atypical year. Likewise, livestock budgets were developed for present livestock programs, plus the alternatives of cattle feeding and the addition of a one-litter hog system.

After the optimum income plan was developed for each farm, a second visit was made. The objective of this visit was to determine the operator's ability and willingness to change to the optimal organization and to determine why he had not already employed the optimal practices.

ASSUMPTIONS

The analysis of the optimum organization for each farm compared with the present program was based on the following assumptions:

1. The tillable acres reported for 1965 were used for the program and alternative programs were considered capable of supporting a continuous corn program.
2. The present machinery was adequate for the revised and existing plans.
3. The existing family and hired labor were available and an unlimited amount of additional hired labor could be obtained at $1.50 per hour.
4. Livestock alternatives were limited to swine and beef-feeder calf or a beef feeding enterprise.
5. The management level was programmed at the 1965 production efficiency level, regardless of volume or size of enterprise.
6. Prices of commodities purchased or sold were based on a 6-year Ohio market value average (1960 through 1965) with the exception of wheat, which was modified in accord with the

changes in the government program and the world market situation.

7. The capital required for the 1965 program was available for optimum organizational plans. Additional credit for operating and building improvement was established for two of the four capital levels programmed. Interest on capital was charged at 6.5 percent for operating capital for the tenant and landlord and at 10 percent for additional landlord building capital.

The four levels of assumed capital (capital availability levels) compared for each tenant and landlord program were:

a. Existing operating and building capital.
b. $5,000 additional operating capital credit with the existing building capital.
c. Existing operating capital and $5,000 of additional building capital credit.
d. $5,000 additional operating capital and $5,000 of additional building capital credit.

Assuming a going concern, each *tenant's available capital* was the sum of his cash on hand plus the investment in livestock and crops. The *landlord's available operating capital base* was the value of the units of livestock and crop enterprises on the farm.

The additional building expense restriction as determined by the landlord has an influence on the tenant's optimal program. The building investment was a landlord responsibility and thus was not considered as a tenant expense. It was assumed in the tenant programs that the landlord's available capital for operational expenses was not a limiting factor.

For the landlord programs, it was assumed that the tenant's operating capital and labor availability were not a limitation.

FINDINGS

General Analysis for 1965

The average tenant was 39 years old and farmed 328 crop acres. He had completed 12 years of formal education and had operated a farm for 16 years. The typical landlord had a total investment of $189,752. The average tenant's total assets were $35,521 or 18.7 percent of the landlord's total assets. The average tenant made a 14.3 percent return on his investment and the landlord had a 6.1 percent return in 1965. However, when the 6-year average prices (1960-65) were used with 1965 production performance, the average landlord made a 3.7 percent return and the average tenant earned a 1.2 percent return on investment

after all other expenses, including depreciation, management, and $450 per month for operator's labor.

Nine of the 16 farm business operations on the resident farms were operated with written leases. These nine contracts included an automatic yearly renewal if notice of termination was not given by an established date. The other seven had a similar renewal understanding but used an oral agreement.

Nine tenants operated more than one farm unit and four farmed three or more farm units. The 16 tenants had farmed the presently operated resident farm units for an average of 8½ years.

Fifteen landlords on tenant resident farms paid one-half of the hay harvesting costs. All 16 landlords paid 50 percent of soybean and small grain harvesting costs. Seven tenants were responsible for all corn harvesting costs and nine tenants shared corn harvesting costs. Four tenants paid all costs of grain and livestock transportation to market or to first storage. Five landlords paid for the grass seed but all other seed and fertilizer expenses were divided equally.

The variation in 1965 tenant gross incomes ranged from $71,883 to $15,263. Tenant family labor and management incomes ranged from $7,965 to $24,949 in 1965 and from $2,782 to $19,167 when 6-year average prices were used.

For analysis purposes, the 16 tenant-operated farms were divided into the high five, medium six, and low five farms based on family labor and management income.

Tenants required more operating capital than the landlord because of the demand for variable expenses, particularly for crop production. The tenant capital demand in excess of landlord capital ranged from 18.4 to 21.7 percent.

Four of the five farms with the largest number of crop acres had the highest labor and management income. However, the fifth farm in size with 461 crop acres was found to have the lowest income in this study. This was located within 1 mile of the high income farm and had similar soil, buildings, and climatic conditions.

The five highest income tenants used a higher percentage of credit than the other income groups. This group borrowed an average of 33.1 percent of their total assets, while the low five income farmers had an average debt of 12.1 percent of their total assets.

Influence of Capital Availability with Optimum Organization

The 16 farms were programmed and analyzed at four capital levels for the tenant and four capital levels for the landlord. The I.B.M. 7094 computer was used to solve for the optimum programs.

Profits: The profits above variable costs for the tenant and landlord in each income group were compared with the present program and with the optimal organization plans by levels of capital availability. Landlord and tenant fixed costs were held constant for all levels of capital programmed. Therefore, income above variable costs serves as an indication of the change in net farm income resulting from organization modifications (Figure 1).

The landlord had higher fixed costs than the tenant in all except the medium group (Table 1). The medium group had the smallest tillable acreage and the highest percentage of income from livestock.

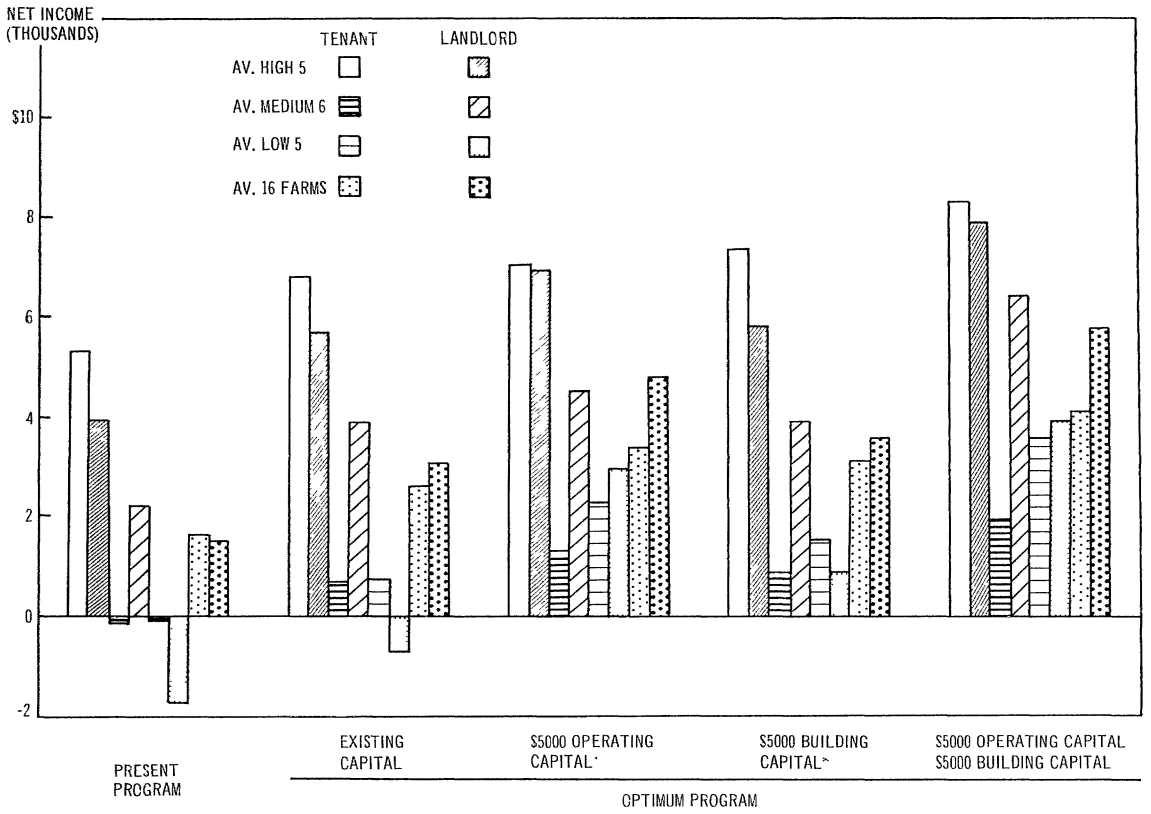
Profits above variable costs were increased over existing programs with no added operating money and building investment for all income groups. Profits were increased when additional operating capital was available for both tenure groups. The greatest increase was realized when both additional operating and building capital were added. Landlord profits experienced greater increases than tenant profits for all income comparisons (Figure 1).

Sow Numbers: There were 2 to 3-sow unit decreases in the high income farm group for both tenant and landlord plans, 8-sow unit increases for the medium group, and 13-sow unit increases for the low income group over the present tenant program. The landlord's optimum program for this capital level increased by 2 sows for the medium and 13 sows for the low income group (Figure 2).

Crop Rotation: The major demand for increased operating capital was for an increased acreage of corn and soybeans (Figure 3). The rotated acres for the 16 farms averaged 328 acres, with the high income group averaging 456 acres; medium income group, 190 acres (this group

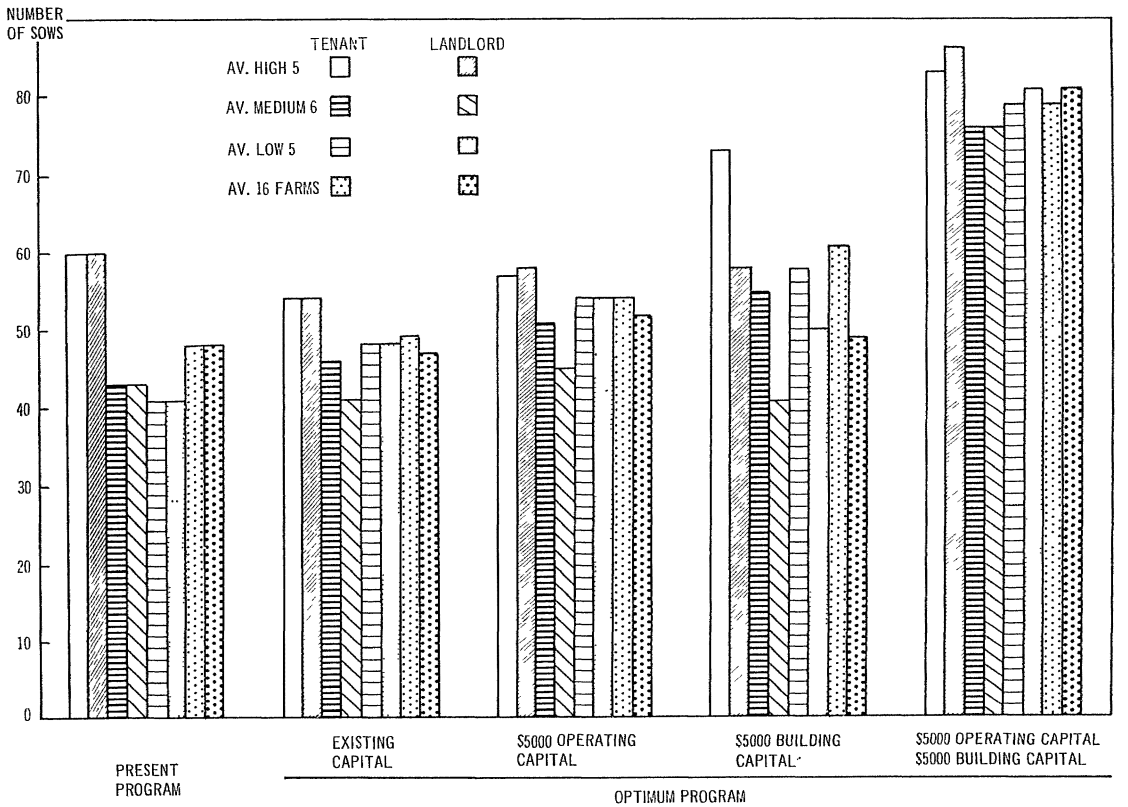
TABLE 1.—Annual Fixed Costs by Income Groups for Tenant and Landlord, Ohio, 1965.

Farm Income Group	Tenure Group	
	Tenant	Landlord
High 5 Farms		
Average	$11,931	$14,882
Range	$10,081 — $13,940	$10,635 — $17,711
Medium 6 Farms		
Average	$10,057	$ 8,807
Range	$ 4,759 — $21,272	$ 4,685 — $14,950
Low 5 Farms		
Average	$ 8,678	$13,609
Range	$ 6,856 — $ 9,731	$ 8,480 — $18,103
16 Farms		
Average	$10,212	$12,206
Range	$ 4,759 — $21,272	$ 4,685 — $18,103



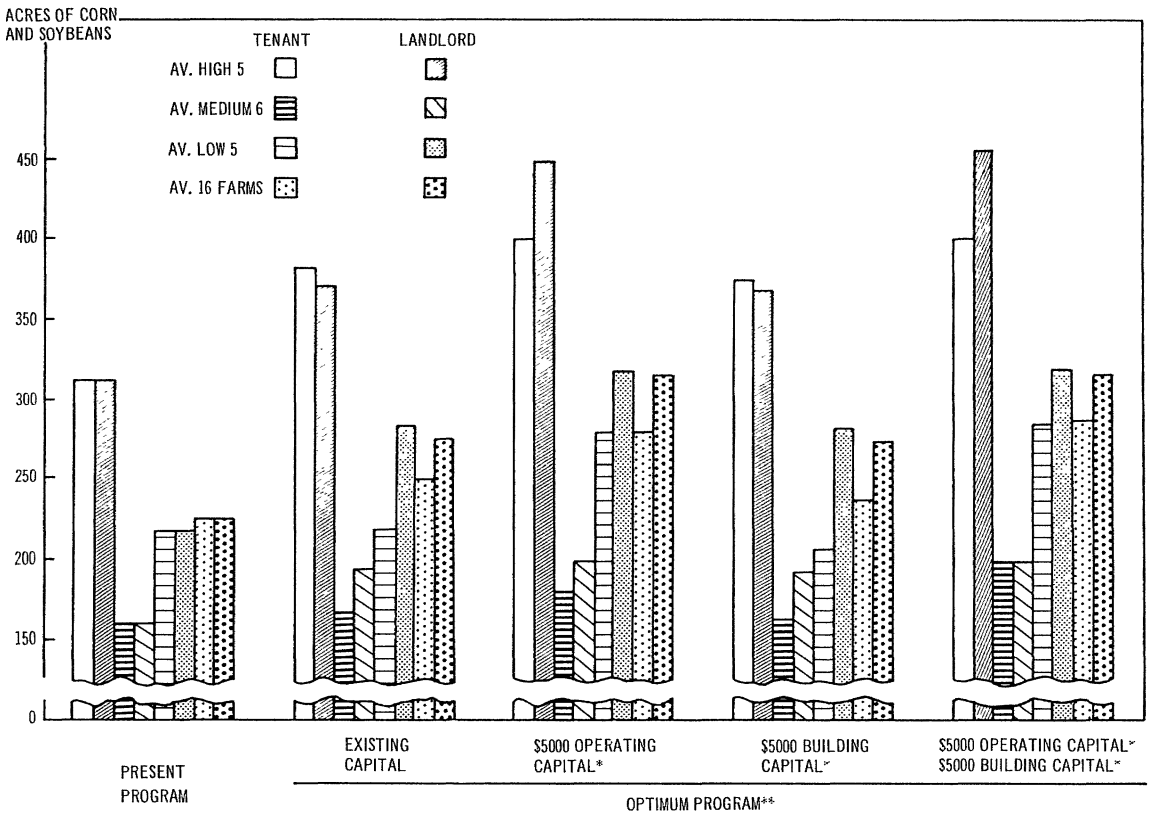
*Available As Credit. **Includes Existing Operating And Building Capital.

FIG. 1.—Net profit above fixed and variable costs by capital levels for optimum and existing farm organizations.



*Available As Credit. Includes Existing Operating And Building Capital.

FIG. 2.—Number of brood sows per farm at four different capital levels with optimum organization compared to present farm organization by high, medium, and low income groups and average of 16 farms.



*Available As Credit. **Includes Existing Operating And Building Capital.

FIG. 3.—Number of acres of corn and soybeans per farm at four different capital levels with optimum organization compared to the present farm organization by high, medium, and low income groups and average of 16 farms.

had highest percent of total income from livestock sales); and low income group, 355 acres of rotated land per farm.

With use of the latest technologies, rotated acreage on all farms was assumed to have a potential of continuous corn. From the landlord's point of view, the optimum crop program increased soybeans and corn by 51 acres while the tenant optimum was to increase these crops by 25 acres. For the high five income farms, comparative figures were tenant 65 acres and landlord 50 acres. The smallest increases in row crop acreage were made in the medium six income group, which were 5 acres for the tenant and 33 acres for the landlord (Figure 3).

When additional operating capital was added and building capital held constant, the average increases for the 16 farms were 54 acres of cropland for the tenant and 91 acres for the landlord over the present program. The largest increases in row crop acres were on the high five income farms, with an 88-acre increase for the tenant and 142-acre increase for the landlord. The smallest increases were for the medium six income farms and were 19 acres for the tenant and 29 acres for the landlord.

When no added operating capital was available and additional building credit was increased to $5,000, the corn and soybean acreage increased 12 acres for the tenant and 50 acres for the landlord over the present program for the 16 farms. Crops returned more than hogs when no added capital was available for the landlord. In the high income situation, the row crops increased 61 acres and 57 acres for tenant and landlord, respectively. The tenants for the low five and the medium six income farms increased the number of acres of corn and soybeans by 9 and 11 acres, respectively, while the landlords increased 31 acres for the medium group and 67 acres for the low income group.

Equitability of Lease

The average of the 16 farms showed that the tenant received $102 more income return than the landlord with the present program. However, with the optimum organization, the landlord would net from $433 to $1,687 above the tenant. This indicates that even though the tenant would profit income-wise from the changed organizational plans, the landlord would realize more profit by improving his farm organization program.

The high five income farms deviated considerably from the average of the 16 farms. The average tenant was above the landlord in this group as much as $1,344 in the present program and $56 to $1,530 in optimum organizations.

The medium six income farms gave opposite solutions from the high income group, with the landlord leading in all capital levels by

$2,248 to $4,469. In this group, the land resources were considerably below the high and low income groups and the livestock programs were the major income-producing resource compared to the high and low income groups.

Considering all 16 farms, the leases appear to be reasonably fair in the present programs and in the first and third capital levels where additional operating capital was not added. However, when adequate additional amounts of operating capital were added in the second and the fourth capital availability levels, the leases appear to favor the landlord with $1,424 and $1,687 of income, respectively.

The lease agreement favors the tenant, considering all capital levels, in the high income group. It should also be noted that the high income group landlords made the highest income in this group. The opposite was true with the medium six income farms, where livestock contributed the highest percent of the income and fewer crop acres were farmed. The landlord had the income advantage of $2,248 to $4,469 per farm in the medium six income group. The landlord in the low five income group was in a less favorable position than the tenant at all capital levels except at the top available building and operating credit levels.

Reaction of Farmers to Linear Programmed Results

The tenants participating in the study were re-visited to obtain individual reactions to the linear programming results. Each tenant was questioned about the optimum farm organization changes and why these changes were not already underway. Tenants also anticipated landlord reactions to the optimum plans.

Linear programmed farm planning was accepted favorably by 12 of the 16 tenants interviewed. These men were impressed by the detailed records needed and the precision of the results. Most did not comprehend the mechanics of the procedure but had learned about linear programming in farm news media. The most interesting expressed observation was their feeling that the results were *final* and *official*.

The other four tenants were less knowledgeable about farm budgeting, were not acquainted with linear programming, and displayed little confidence in the results.

Most plans called for increased acreage of corn and soybeans and reductions in sod and small grain crops. Half of the tenants were in agreement with the higher percentage of row crops and four had already intensified their cropping programs to the levels recommended since the first interview 1 year earlier. The other eight tenants were considering more row crops but expressed the need for more sod crops which could be used for hog pasture and soil improvement. At least four of these

tenants were interested in intensifying their rotation as a result of their experience with this study.

When asked why they didn't already have more row crops, eight tenants indicated that the landlord would disapprove. They believed the landlord thought at least 25 percent of the land should be in sod in order to maintain soil tilth. On four farms, the landlord wanted the hay and pasture for a beef brood herd. Two tenants resisted more intensive rotations and two tenants said it was mutually decided to feed hogs on rotation pasture.

Ten tenants thought their landlords would accept the optimum organization rotation changes. They thought the landlords did not understand the value of commercial nitrogen and the economics of an intensive rotation. Three said that the landlord would not permit the change. The other three said their landlord would consider a change but that government programs and soil conservation service recommendations would prevent total acceptance of some of the optimum plans.

Nine of the 16 optimum plans called for an increase in the "sow and two-litter units" when extra operating capital was available. Fourteen plans called for substantial increases in the number of sow units when both additional operating and building capital were included.

The tenants foresaw the following problems if sow numbers were increased:

1. Twelve tenants stated that it was difficult to obtain qualified labor.
2. Ten considered manure disposal an obstacle.
3. Five said the landlord would not build the needed facilities.
4. Four stated chance of more disease was a common problem.
5. Three mentioned that they were getting tired of hogs and wanted to raise more crops and feed more cattle.
6. Three reported that sows and market hogs need rotation pasture.
7. Need for a vacation was listed by one tenant, who said more hogs would conflict with this.

Thirteen tenants were willing to increase the number of sows if the landlord would build the needed additional facilities. The other three said they were at their personal limit, regardless of additional buildings or available labor.

The optimum program eliminated the beef cow herds on the four farms presently including beef cows. The tenants favored exclusion of beef cows from the farms but the landlords were expected to resist the change. In the fourth situation, the tenant said he was sure the land-

lord could see the logic of the recommendation and would agree to buy feeders instead of raising calves.

Twelve tenants said the results were "about what they expected," although "more drastic." More row crops and elimination of the beef cow herd were anticipated. Two said the results were a lot more exact and detailed than expected and the other two said they had no idea what would come back.

In general, the increased income in the first capital level, without an increase in operating or building capital, came from the use of both the rotation land and the buildings at a more intensive level. In reality, this required little additional overhead expenditure and most tenants felt the changes would be profitable and practical. In most cases they were pleased with the increased money making possibilities of the recommended plans for both tenants and landlords. Three of the 16 tenants questioned the profit-making possibilities of the optimum plans and remarked that such plans work better on paper than in the real world.

All of the top five income tenants were willing to borrow the recommended operating capital and to follow the crop program but were less willing to increase the hog program. This was the same reaction for five out of six tenants in the medium income group. Three of the five in the low five income group said they were not interested in going into debt. Two of these tenants were debt-free.

CONCLUSIONS

- The 1965 farm business performance records were used in the analysis of 16 tenant-operated pork-producing farms. The following factors were common to the five high income tenant operators for the 1965 program and the optimum organization programs at four capital levels.[1] The high income tenants had:

  a. Highest productive man work units per man.
  b. Highest crop yields and largest crop acreages per farm.
  c. Borrowed more capital for their present program. The top five income tenants also expressed willingness to borrow the needed operating capital for the optimum programs.
  d. Higher net profit (relative to landlord profit).
  e. Larger number of hogs marketed (swine production performance was not as high as the medium income farms).
  f. More capital was invested by both the landlord and tenant. The high income tenants had larger capital investments than the medium or low income tenants. The high five

[1]Income means labor and management income to tenant operator. This is income after all current expenses, plus depreciation and interest on own equity at 5 percent.

income tenants averaged 22.1 percent and the low five income tenants averaged 12.4 percent of the total farm capital investment.

- The limiting farm resources, from analyses of returns at four capital levels, were operating capital, availability of rotation land, and building space. The analyses indicate that the operating capital limitation has more effect on profit than the limitation of building space for both tenant and landlord. The increase in income was greater for the landlord than the tenant when additional operating capital was available. There was a greater increase in income from the additional operating capital in the low and medium income groups for both tenant and landlord than in the high income group.

- Under the existing lease agreements, the landlords had a higher net profit than the tenants with the optimum organization plans at all capital levels. This difference ranged from $433 to $1,687 annual net income.

- The average landlord had a higher return above variable costs than the tenant for the addition of an acre of rotation land.

- Willingness to borrow operating capital was associated with the high income group of farmers. One-third of the total capital used by the average high income group tenants was borrowed, while the medium group tenants borrowed 29 percent and the low income group tenants borrowed 12 percent of their total assets.

- The major changes in resource allocation for maximum profit for all 16 farms were an increase in corn and soybean acreage at the expense of sod and small grain, the elimination of the beef brood herd and the purchase of beef feeders, and an increase in the number of sow units. Optimum programs required capital to intensify the cropping programs and the swine programs.

The State Is the Campus for Agricultural Research and Development

Ohio's major soil types and climatic conditions are represented at the Research Center's 12 locations. Thus, Center scientists can make field tests under conditions similar to those encountered by Ohio farmers.

Research is conducted by 13 departments on more than 6200 acres at Center headquarters in Wooster, ten branches, and The Ohio State University.

Center Headquarters, Wooster, Wayne County: 1953 acres

Eastern Ohio Resource Development Center, Caldwell, Noble County: 2053 acres

Jackson Branch, Jackson, Jackson County: 344 acres

Mahoning County Farm, Canfield: 275 acres

Muck Crops Branch, Willard, Huron County: 15 acres

North Central Branch, Vickery, Erie County: 335 acres

Northwestern Branch, Hoytville, Wood County: 247 acres

Southeastern Branch, Carpenter, Meigs County: 330 acres

Southern Branch, Ripley, Brown County: 275 acres

Vegetable Crops Branch, Marietta, Washington County: 20 acres

Western Branch, South Charleston, Clark County: 428 acres